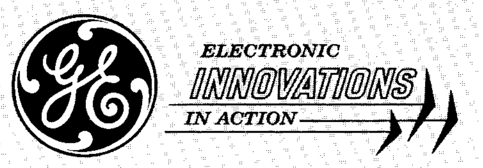


TUBES

—PRODUCT INFORMATION—

31AL10

Compactron
Dissimilar-Double-Triode Pentode

- VERTICAL OUTPUT PENTODE
- VERTICAL OSCILLATOR
- SYNC CLIPPER
- LOW HEATER POWER
- 140 VOLTS B+

The 31AL10 is a compactron containing a medium-mu triode, a high-mu triode, and a high-perveance beam pentode. The pentode is intended for vertical output service in monochrome television receivers operating from 140 volts B+. The two triodes are intended for vertical oscillator and sync clipper functions.

GENERAL

ELECTRICAL

Cathode - Coated Unipotential

Heater Characteristics and Ratings

Heater Voltage, AC or DC★	31.5	Volts
Heater Current●	0.315 ± 0.02	Amperes
Heater Warm-up Time, average♦	11	Seconds

Direct Interelectrode Capacitances, approximate▲

Triode (Section 1)

Grid to Plate: (T1g to T1p)	3.0	pf
Input: T1g to (h + k + Pb.p.)	3.2	pf
Output: T1p to (h + k + Pb.p.)	0.4	pf

Triode (Section 2)

Grid to Plate: T2g to T2p)	3.7	pf
Input: T2g to (h + k + Pb.p.)	2.0	pf
Output: T2p to (h + k + Pb.p.)	0.6	pf

Pentode Section

Grid-Number 1 to Plate: (Pg1 to Pp)	0.24	pf
Input: Pg1 to (h + k + Pg2 + Pb.p.)	12	pf
Output: Pp to (h + k + Pg2 + Pb.p.)	8.0	pf

MECHANICAL

Operating Position - Any

Envelope - T-9, Glass

Base - E12-70, Button 12-Pin

Outline Drawing - EIA 9-59

Maximum Diameter	1.188	Inches
Minimum Diameter	1.062	Inches
Maximum Over-all Length	2.625	Inches
Maximum Seated Height	2.250	Inches
Minimum Seated Height	2.000	Inches

MAXIMUM RATINGS

Design-Maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.

The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making allowance for the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration.

The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all other electron devices in the equipment.

PHYSICAL DIMENSIONS

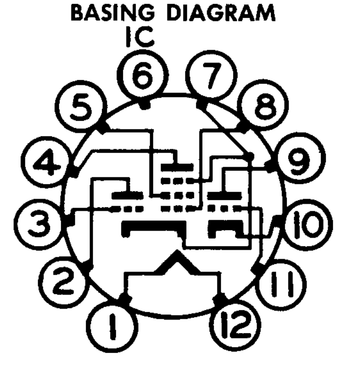
1.188" MAX.
1.062" MIN.
2.625" MAX.
T9
2.250" MAX.
2.000" MIN.

EIA 9-59

TERMINAL CONNECTIONS

Pin 1 - Heater
Pin 2 - Triode Plate (Section 2)
Pin 3 - Triode Grid (Section 2)
Pin 4 - Pentode Plate
Pin 5 - Pentode Grid Number 2 (Screen)
Pin 6 - Internal Connection - Do Not Use
Pin 7 - Triode Cathode (Section 2), Pentode Cathode, and Pentode Beam Plates
Pin 8 - Pentode Grid Number 1
Pin 9 - Triode Plate (Section 1)
Pin 10 - Triode Cathode (Section 1)
Pin 11 - Triode Grid (Section 1)
Pin 12 - Heater

BASING DIAGRAM



EIA 12HR



MAXIMUM RATINGS (Cont'd)

DESIGN-MAXIMUM VALUES

Pentode Section - Vertical-Deflection Amplifier Service□

DC Plate Voltage	250	Volts
Peak Pulse Plate Voltage	2000	Volts
Screen Voltage	200	Volts
Peak Negative Grid-Number 1 Voltage	150	Volts
Plate Dissipation	7.0	Watts
Screen Dissipation	1.8	Watts
Total DC Plate and Screen Current	70	Milliamperes
Total Peak Plate and Screen Current	245	Milliamperes
Heater-Cathode Voltage		
Heater Positive with respect to Cathode		
DC Component	100	Volts
Total DC and Peak	200	Volts
Heater Negative with respect to Cathode		
Total DC and Peak	200	Volts
Grid-Number 1 Circuit Resistance		
With Fixed Bias	1.0	Megohms

Triode (Section 1)

Plate Voltage	330	Volts
Positive DC Grid Voltage	0	Volts
Plate Dissipation	1.25	Watts
Heater-Cathode Voltage		
Heater Positive with respect to Cathode		
DC Component	100	Volts
Total DC and Peak	200	Volts
Heater Negative with respect to Cathode		
Total DC and Peak	200	Volts
Grid-Circuit Resistance		
With Fixed Bias	0.5	Megohms

Triode (Section 2) - Vertical Oscillator Service□

DC Plate Voltage	250	Volts
Peak Negative Grid Voltage	400	Volts
Plate Dissipation	1.0	Watts
DC Plate Current	20	Milliamperes
Peak Plate Current	70	Milliamperes
Heater-Cathode Voltage		
Heater Positive with respect to Cathode		
DC Component	100	Volts
Total DC and Peak	200	Volts
Heater Negative with respect to Cathode		
Total DC and Peak	200	Volts
Grid-Circuit Resistance		
With Fixed Bias	1.0	Megohms

CHARACTERISTICS AND TYPICAL OPERATION

AVERAGE CHARACTERISTICS

Pentode Section

Plate Voltage	45	120	Volts
Screen Voltage	110	110	Volts
Grid-Number 1 Voltage	0⊕	−8.0	Volts
Plate Resistance, approximate	---	11700	Ohms
Transconductance	---	7100	Micromhos
Plate Current	122	46	Milliamperes
Screen Current	16.5	3.5	Milliamperes
Grid-Number 1 Voltage, approximate			
Ib = 100 Microamperes	---	−25	Volts

CHARACTERISTICS AND TYPICAL OPERATION (Cont'd)

Triode (Section 1)

Plate Voltage	150	Volts
Grid Voltage	−2.0	Volts
Amplification Factor	43	
Plate Resistance, approximate	11000	Ohms
Transconductance	3900	Micromhos
Plate Current	5.4	Milliamperes
Grid Voltage, approximate Ib = 10 Microamperes	−5.7	Volts

Triode (Section 2)

Plate Voltage	150	Volts
Grid Voltage	−5.0	Volts
Amplification Factor	20	
Plate Resistance, approximate	8500	Ohms
Transconductance	2350	Micromhos
Plate Current	5.5	Milliamperes
Grid Voltage, approximate Ib = 10 Microamperes	−11	Volts

NOTES

★ Heater voltage for a bogey tube at If = 0.315 amperes.

● The equipment designer should design the equipment so that heater current is centered at the specified bogey value, with heater supply variations restricted to maintain heater current within the specified tolerance.

♦ The time required for the voltage across the heater to reach 80 percent of the bogey value after applying 4 times the bogey heater voltage to a circuit consisting of the tube heater in series with a resistance equal to 3 times the bogey heater voltage divided by the bogey heater current.

▲ Without external shield.

□ For operation in a 525-line, 30-frame television system as described in "Standards of Good Engineering Practice Concerning Television Broadcast Stations", Federal Communications Commission. The duty cycle of the voltage pulse must not exceed 15 percent of one scanning cycle.

⊕ Applied for short interval (two seconds maximum) so as not to damage tube.

AVERAGE PLATE CHARACTERISTICS

PENTODE SECTION

E_f = RATED VALUE
E_{c2} = 110 VOLTS

Ib @ Ec1 = 0 VOLTS
Ic2 @ Ec1 = 0 VOLTS

PLATE CURRENT (Ib) IN MILLIAMPERES

SCREEN CURRENT (Ic2) IN MILLIAMPERES

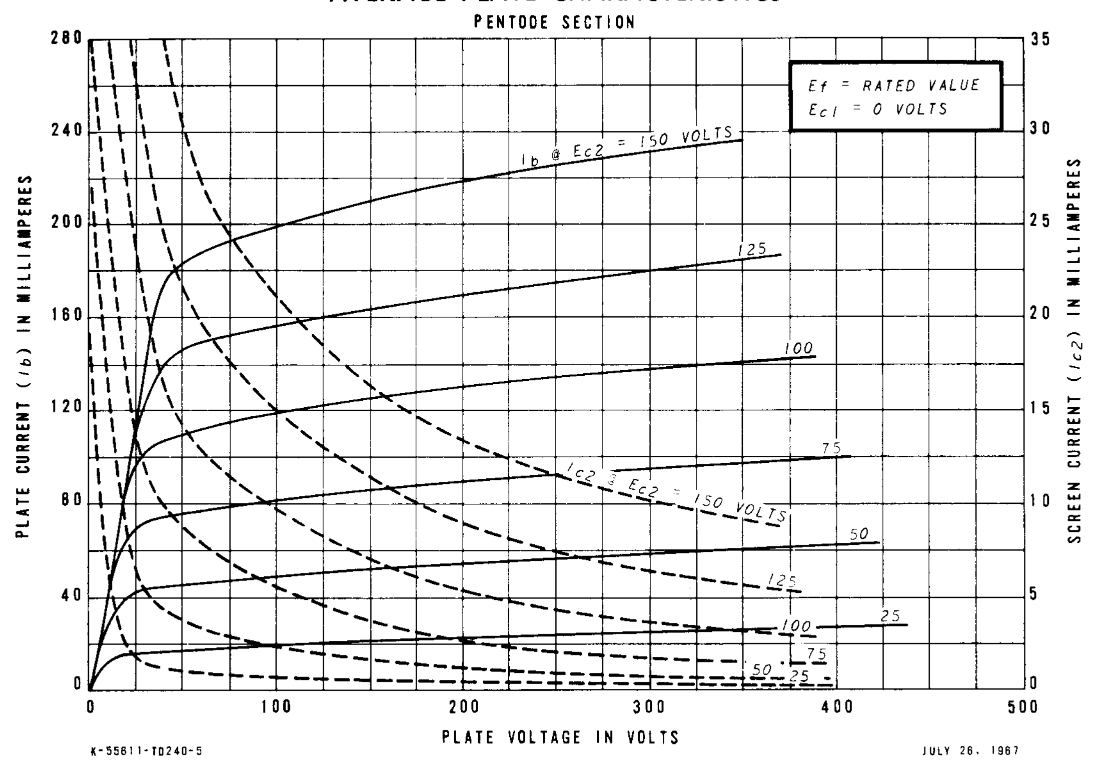
PLATE VOLTAGE IN VOLTS

K-55611-TD240-4

JULY 26, 1967

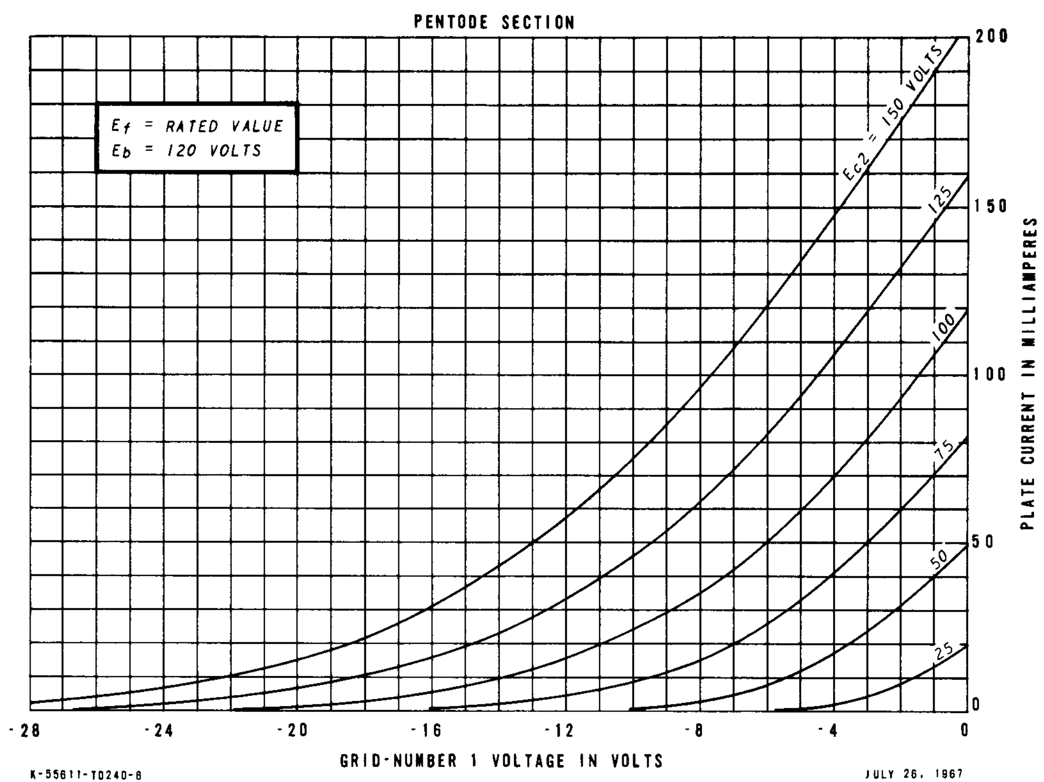
AVERAGE PLATE CHARACTERISTICS

PENTODE SECTION

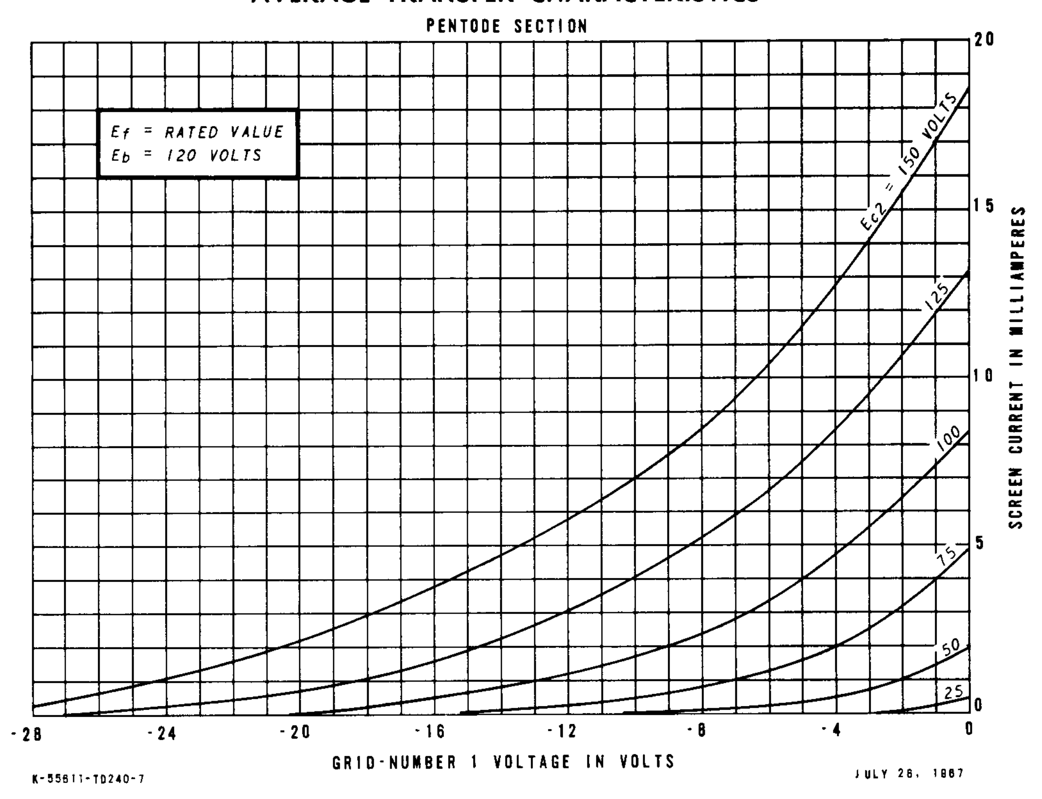


AVERAGE TRANSFER CHARACTERISTICS

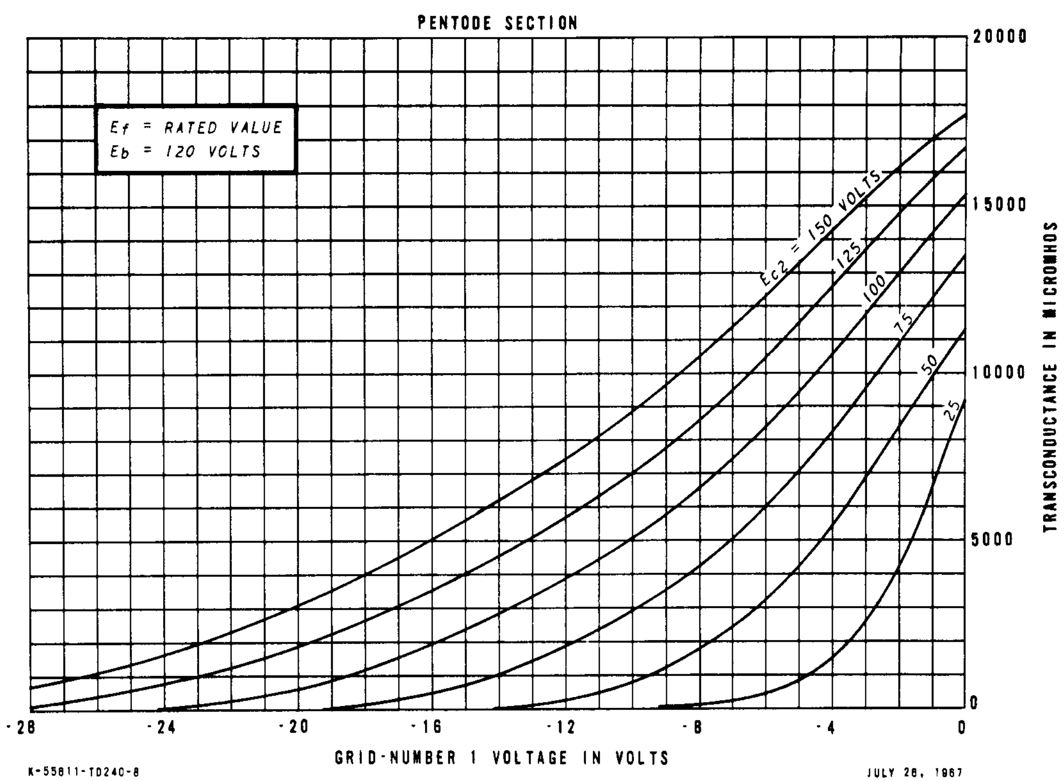
PENTODE SECTION



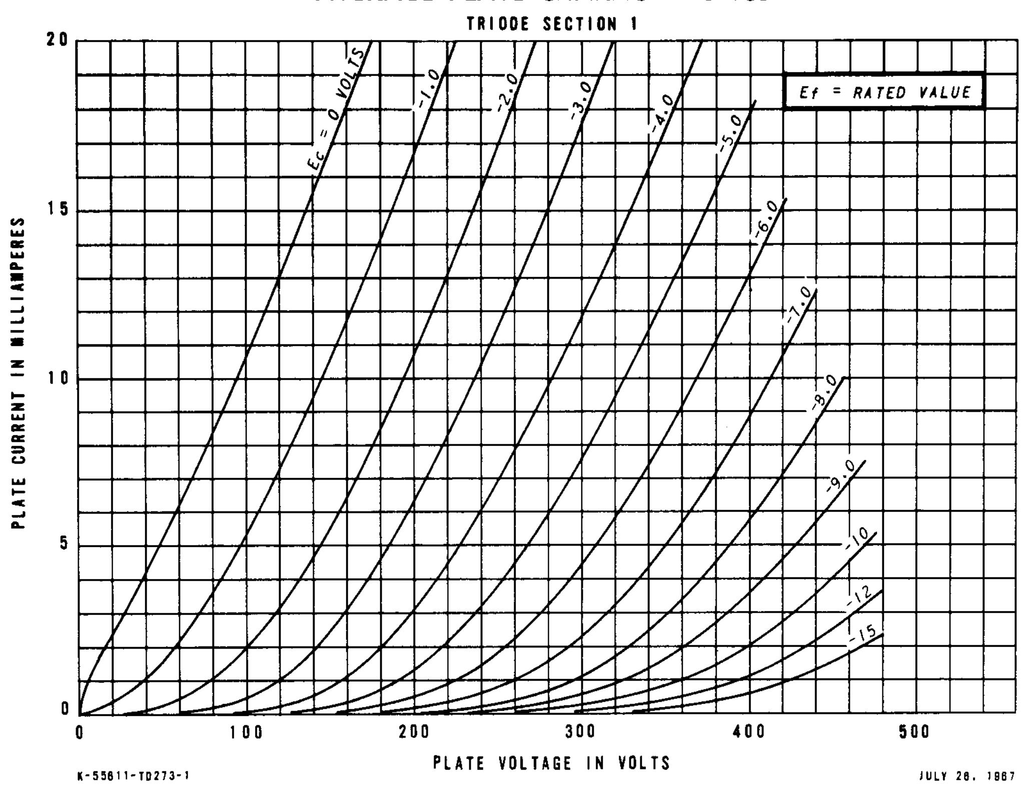
AVERAGE TRANSFER CHARACTERISTICS



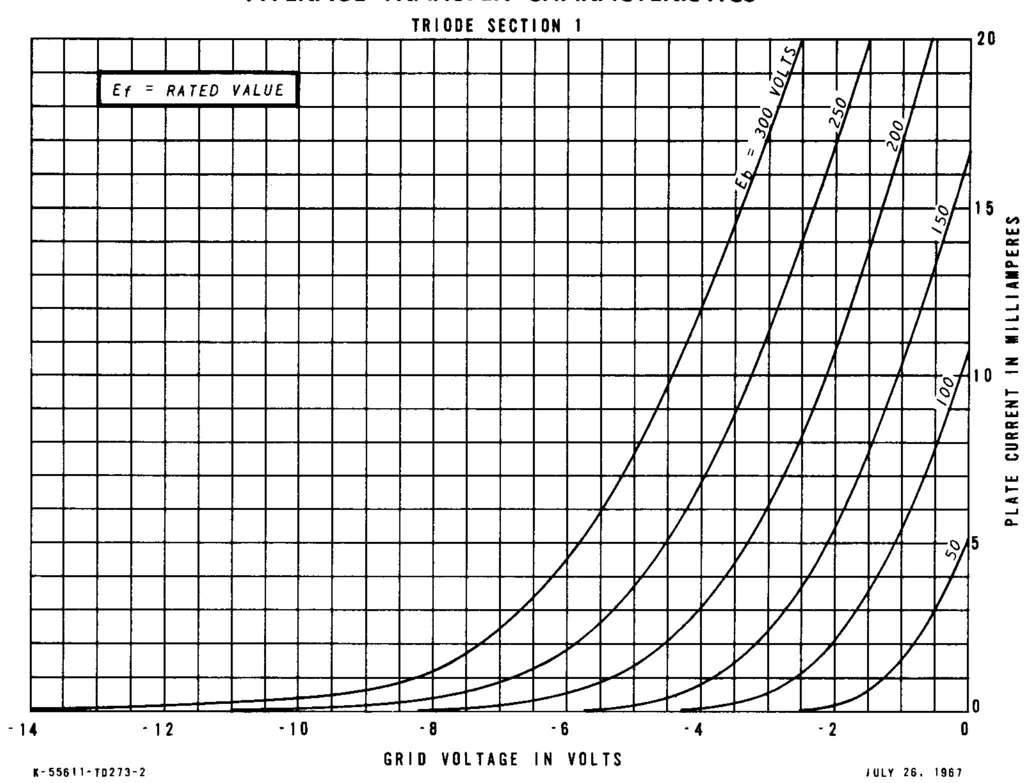
AVERAGE TRANSFER CHARACTERISTICS



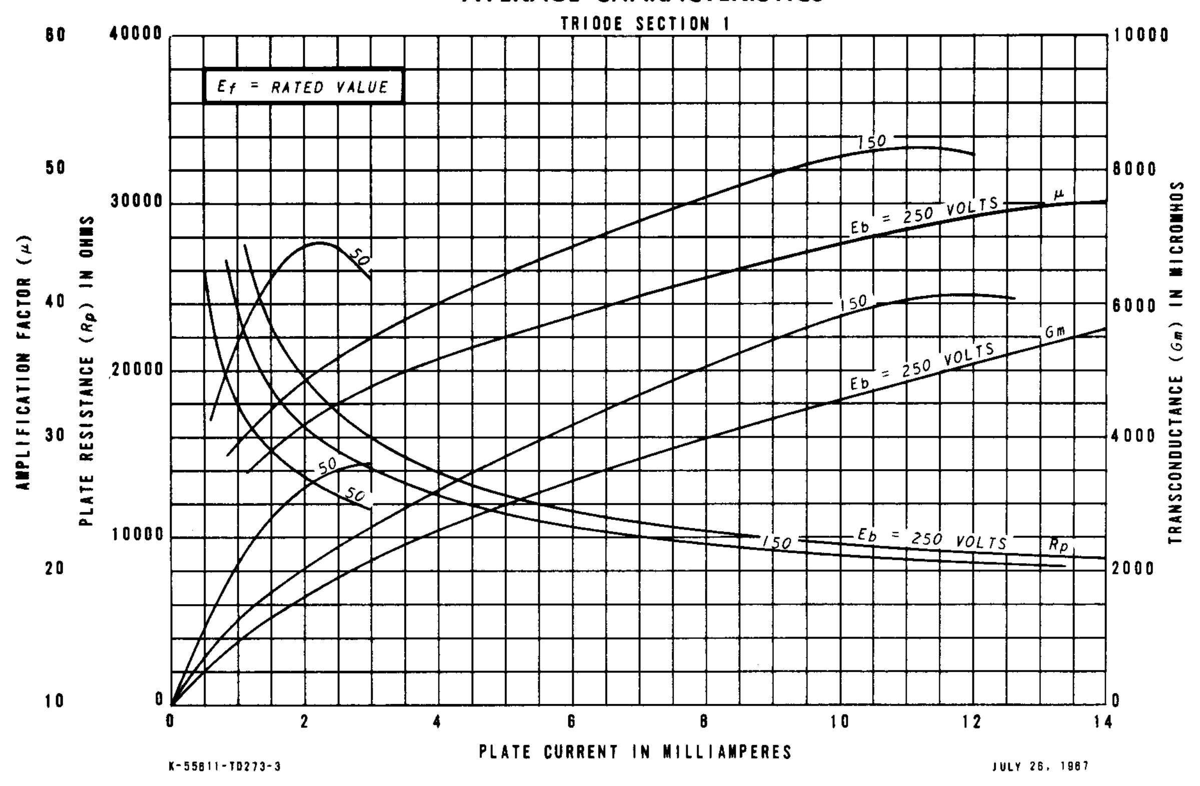
AVERAGE PLATE CHARACTERISTICS



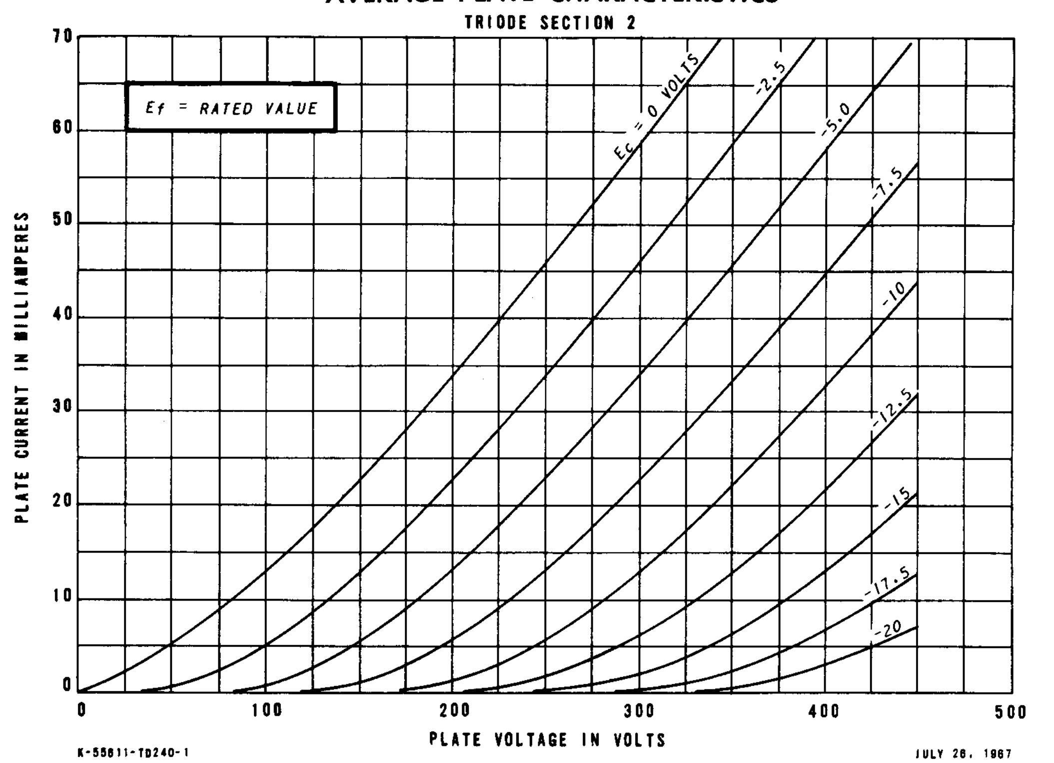
AVERAGE TRANSFER CHARACTERISTICS



AVERAGE CHARACTERISTICS

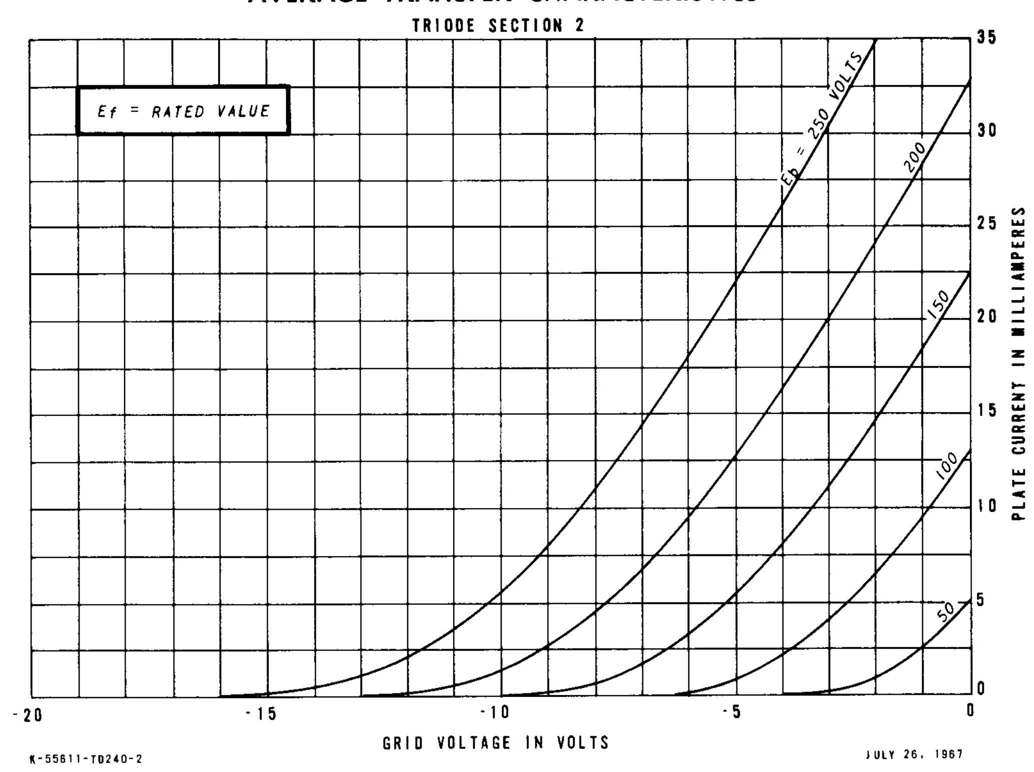


AVERAGE PLATE CHARACTERISTICS



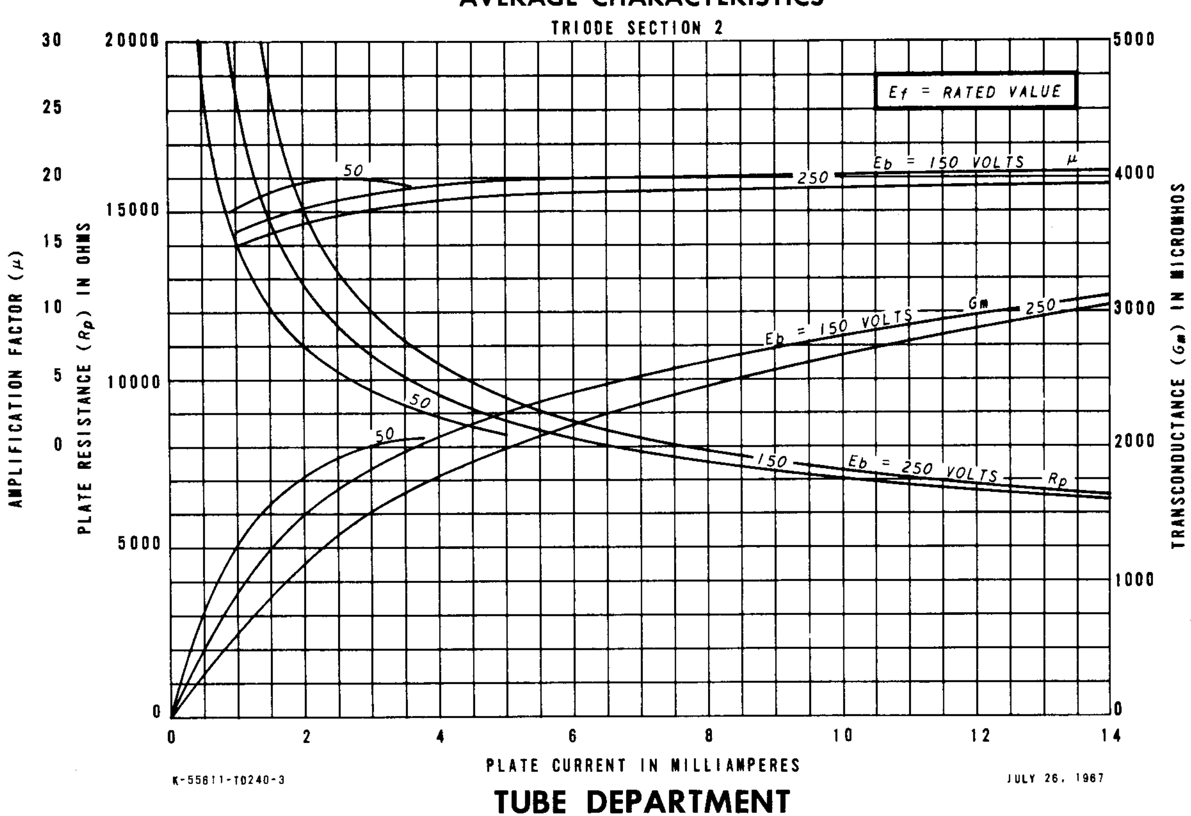
AVERAGE TRANSFER CHARACTERISTICS

TRIODE SECTION 2



AVERAGE CHARACTERISTICS

TRIODE SECTION 2



TUBE DEPARTMENT

GENERAL  ELECTRIC

Owensboro, Kentucky 42301